

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Service Rules for the 698-746, 747-762	)	WT Docket No. 06-150
and 777-792 MHz Bands	)	
	)	
Implementing a Nationwide,	)	PS Docket No. 06-229
Broadband, Interoperable	)	
Public Safety Network in the	)	
700 MHz Band	)	

**SECOND FURTHER NOTICE OF PROPOSED RULEMAKING**

**COMMENTS BY HYPRES, INC.**

Hypres, Inc. is submitting these comments in response to the SECOND FURTHER NOTICE OF PROPOSED RULE MAKING (NPRM), FCC 08-128, Released May 14, 2008.

Hypres, Inc. is a manufacturer of exceptionally high-performance and cost-effective electronic equipment using Superconductor MicroElectronic (SME) technology. Hypres has demonstrated digital circuit capabilities that far exceed the performance currently available and forecasted with semiconductors and other implementations. The performance of these circuits enables real-time processing of RF signals in the digital domain at frequencies unattainable with legacy technology. Hypres brings the power of digital processing to the RF domain. The technology is so accurate, it defines the standard volt; it is so sensitive, it can measure brain currents.

Hypres, Inc. is a member of the Software Defined Forum (SDRF), and has participated in development of the SDRF response to the subject NPRM. Hypres endorses the positions taken by SDRF.

In these comments, Hypres makes a general recommendation regarding the role of high quality wideband data services in emerging applications, the proposed 700 MHz Public Safety/D-Block licensee collaboration, and the opportunity to develop Nationwide Broadband Network (NBN), a unified communications system for both Public Safety and commercial applications needing controlled Quality of Service (QoS). We then proceed to respond to

requests for comment, and to answer a number of specific questions from the NPRM.

## **General Recommendations**

In considering this opportunity it is critical to keep it in the perspective of a wide-band data service that is an enhancement to any capability the Public Safety community currently uses in general service. The proposed service opens the possibility of wireless graphics, pictures, video, bulk data transfer, and connection to extensive remote computation. Although the system can support voice over IP, In particular, it should not be required to replace mission-critical voice capability, particularly when such requirements would serve to inhibit or defer availability of the new data capabilities. The time horizon for the architecture should assure both long-term viability and adaptability to new and emerging technology. The conceptual timeframe should be measured in decades, not months.

Hypres makes the following general recommendations. The network should be:

1. A commercially operated wideband wireless data network, with high reliability and extensive coverage, used by both Public Safety and commercial users..
2. Positioned as a special high-quality service, offering managed levels of QoS. It also should have a sophisticated priority schedule so that all users can understand the probabilistic structure underlying their use. Such a structure provides users (or their intelligent terminals) with detailed information about their ability to complete a connection and quality of operation when connected.
3. Based on robust business model that is consistently profitable. Marginal profitability leads to attempts to reduce cost, and detracts from the provider's focus on operational effectiveness.
4. Designed with a flexible architecture, and implemented incrementally to encourage new uses and to accommodate emerging technology.
5. Capable of incorporating new technology as it emerges as well as supporting existing technology over a period of time consistent with Public Safety equipment replacement cycles.

Hypres sees its role in this market as offering extremely high performance radio frequency front ends, particularly for rural base stations. By incorporating flexibility to adjust operating parameters such as radiated power, frequency, bit-rate, and band-width, such installations adjust to optimize current operating conditions. In particular, they have flexibility to

divert resources, extend range, and ensure reliability of data delivery under both normal and emergency conditions.

## **Specific Recommendations**

In the following sections we offer specific answers to questions proposed in the NPRM.

### ***Paragraph 38***

As noted in the NPRM at this paragraph, there have been several installations of wideband networks for Public Safety and other uses in the State of Arizona. They have demonstrated that Public Safety organizations can take advantage of incremental data capability<sup>1</sup>. In general, some system enhancements, such as a high security, are essential. Others, such as high-speed hand-off, are not essential, but serve to enhance system reliability and utility.

Use of Software Defined Radio base stations with high performance RF front ends offers an opportunity to meet needs of rural installations. With real-time flexibility to change air interfaces, adjust power, and reconfigure radiation patterns, these stations can respond to both changing loads of commercial traffic and Public Safety needs for emergency response.

The experience of the I-19 project noted that local agencies are likely to have different levels of interest in participating in the NBN. An important lesson learned is a need for architectural features to accommodate different levels of interest.

Lack of participation may be temporary, as in the case where purchase of new terminal equipment is delayed, or it may be long term. In either case, the flexibility of high-performance base stations allows rapid reconfiguration when the need arises. If external resources were brought in to the scene of a natural disaster, plane crash, or train derailment, communication capability could be provided to them even though local agencies in the area were not participating.

### ***Paragraph 54.***

There are a great many advantages to a nationwide, interoperable wireless broadband network. Although there are a number of obstacles to be overcome, the long-term promise is for facilities that will have an impact comparable to innovations such as cellular telephone and the GPS positioning system. The primary obstacle is uncertainty, which gives rise to

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<sup>1</sup> See NPRM submission “COMMENTS BY PETER G. COOK CONSULTANCY, INC.” for more details on Arizona projects.

concerns that the system will fall short of the expectations for it. These concerns can be met with an incremental approach where initial implementations are carefully managed both to demonstrate system capabilities and permit fine-tuning to improve operation.

Advantages of the system include:

1. Usage patterns of Public Safety and commercial operations are complementary. System architecture provides capacity for commercial revenue-generating traffic capacity that is diverted to Public Safety needs on demand.
2. Existing Public Safety communications are optimized for reliable and effective mission-critical communications. The cost to upgrade such systems to provide wideband data capability is prohibitive. But allowing the commercial market to fund system development and operation in return for part-time use of spectrum designated for Public Safety provides support for introduction of wideband applications on a pay-as-you-go basis.
3. Applications will arise that cannot be foreseen at this time. That is the case in both Public Safety and commercial use. Voice is a very effective means of basic communication, but does not make effective use of individual personal bandwidth. Wideband data can provide a rich presentation to support situation awareness, and serve as a basis for decision-making. The same capabilities that enhance command and control also support entertainment, computer gaming, navigation, real estate sales, and other applications not yet envisioned. Other networks have many of these attributes, but only the NBN will offer the same high level of quality and reliability.
4. Economies of scale have led to very low costs in commercial products. The very high volumes required for full realization of those economies can be realized by joint use. Even Public Safety equipment requiring ruggedized packaging will benefit from chip sets and electronics shared with consumer end-items. With a nation-wide buildout, equipment volumes will be adequate to stimulate investment in research and development of new technology. Their introduction will bring introduce new capabilities and facilitate further application areas.

It would be very unfortunate fail to exploit this opportunity to enhance the national infrastructure.

### ***Paragraph 55***

A number of considerations lead to a recommendation for specification of the system in terms of requirements rather than specific technical details. It is

imperative that the system be able to adopt new technology over time. It is impossible to know now what technological developments will emerge in future decades. But if it is at all successful, the network will be mature and in need of upgrade by then. It would be unfortunate to establish overly inhibiting rules in this proceeding; it would be preferable to enable market forces to drive such changes.

Public Safety organizations have historically operated with a longer technological timeframe than consumer electronics. A requirement should be that legacy equipment should continue to operate after replacement technologies are in place. High performance and flexible infrastructure address this need.

*[Note: This response also applies to Paragraph 80.]*

To derive the most benefit from this network, the Public Safety and D-Blocks should be administered as a single entity. Specific connections should be made in such a way as to optimize system operation without imposed segregation. The requirement should be stated in terms of a limit on the combined bandwidth is available to Public Safety. If that level were set at 75%, then commercial users attempting to connect above 25% would be blocked, unless their priority was sufficient to preempt an existing connection.

### ***Paragraph 58***

Rural areas provide a challenge because they combine difficulty in providing coverage with lower demand for commercial services. The high-performance base station addresses these circumstances by adjusting its resources to meet current local needs. Dedicating resources to coverage of areas where there is no need or demand for services is clearly wasteful. But if a terminal moves into an area that has not been active, the base station must be reconfigured to provide coverage there.

The rural portion of the NBN has inherent differences from urban geography. By using high-performance and flexible base stations, coverage can be reconfigured to meet current needs.

### ***Paragraph 118***

*[Note: This recommendation is also relevant to information solicited in NPRM Paragraph 28.]*

A significant amount of spectrum is being designated for Public Safety narrowband operation. Although reserved for Public Safety, these channels are in close spectral proximity, and might be appropriate for use in sparsely

populated areas. It would therefore be appropriate to make provision in the rules that infrastructure put in place primarily for the services envisioned for the NBN, using high-performance base stations, could additionally support narrow-band first-responder operation under specified (not necessarily emergency) circumstances.



## **Conclusions**

Hypres is a small company with a technology that is mature, and has been demonstrated in a number of application areas. While Hypres feels that its SME technology has a great deal to offer to the commercial wireless community and the NBN, it does not have resources to pursue these applications independently.

We therefore support the Commission's efforts to establish a nationwide network with a common architecture. In particular, we feel that our Superconducting MicroElectronics technology, and the resulting high-performance digital RF, make possible flexible and reconfigurable base stations in rural areas where adaptable configurations enable coverage and performance changes to meet specific local conditions. Flexible radiation patterns can assist in meeting Public Safety coverage requirements with a less dense placement of base stations. They can also provide backup coverage for neighboring base stations that are out of service.

Hypres appreciates the opportunity to submit these comments. We are very supportive of the initiative taken by the Commission to both make best use of this spectrum and offer a significant enhancement to the communications facilities available to the Public Safety community.

Hypres strongly supports the goals of NBN, and expresses its interest in participating.

**Respectfully submitted,**

**Richard E. Hitt, Jr.  
President and CEO  
Hypres, Inc.**